Remarks:

Claims 1-14 and 16-28 remain pending in the Subject Application. Claims 15 and 29-98 are canceled. Claims 1-14 and 16-28 stand rejected.

A. Rejections – 35 U.S.C. § 103 (a)

1. Claims 1-5 and 9-10

Claims 1-5 and 9-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,641,780 to Grubb ("Grubb"). Applicant traverses this rejection for the following reason. Applicant notes that Grubb and the Subject Application are owned by the same entity, ATI Properties, Inc. Pursuant to 35 U.S.C. § 103(c), because Grubb is only available as prior art under 35 U.S.C. § 102(e) (Grubb was issued after the filing date of the Subject Application), Grubb is disqualified as § 103(a) prior art against the Subject Application. *See* MPEP § 2146.

Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1-5 and 9-10 under § 103(a) based on Grubb.

2. Claims 7, 11-13, 16-19, 21, and 25-26

Claims 7, 11-13, 16-19, 21, and 25-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grubb in view of U.S. Patent No. 2,692,853 to Gamble ("Gamble"). Applicant traverses this rejection for the following reason. Applicant again notes that Grubb and the Subject Application are owned by the same entity, ATI Properties, Inc. Pursuant to 35 U.S.C. § 103(c), because Grubb is only available as prior art under 35 U.S.C. § 102(e) (Grubb was issued after the filing date of the Subject Application), Grubb is disqualified as § 103(a) prior art against the Subject Application. *See* MPEP § 2146.

Therefore, Applicant respectfully requests withdrawal of the rejection of claims 7, 11-13, 16-19, 21, and 25-26 under § 103(a) over Grubb in view of Gamble.

3. Claims 11-12, 14 and 16-22

Claims 11-12, 14, and 16-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Japanese reference JP 10-280103 to Takehiro ("Takehiro") in view of Gamble. Of these claims, claim 11 is the single independent claim, and each of claims 12, 14, and 16-22 ultimately depend from claim 11. Applicant traverses this rejection for the reasons set forth below.

Recently, the Supreme Court, in *KSR Int'l Co. v. Teleflex, Inc.*, No. 04-1350 (U.S. Apr. 30, 2007), ruled that to support an obviousness rejection, an analysis of obviousness should be made wherein the patent examiner assesses "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." The Court further stated that "[t]o facilitate review, this analysis should be made explicit." (Emphases added.) Also, in response to the KSR decision, Margaret Focarino, Deputy Commissioner for Patent Operations, stated in the attached May 3, 2007 memo to the Patent Office's Technology Center Directors that "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." (Emphasis added.)

Therefore, the Supreme Court's *KSR* decision recognizes that there must be some rational basis for an examiner to combine references in an obviousness rejection. In other words, an examiner cannot arbitrarily combine teachings of prior art references so as to achieve a claimed invention. Indeed, Deputy Commissioner Focarino's May 3 memo confirms and reinforces that there must be a rational basis for an examiner to combine reference teachings in a § 103(a) rejection and that the examiner should identify that basis in an Office Action. Thus, as the case law and the MPEP amply support, absent there being a stated rational basis for combining reference teachings in the manner an examiner sets forth in an obviousness rejection, the examiner has not established a *prima facie* case that the claimed invention would have been obvious. *See also* MPEP 2142. ("The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness.... However, impermissible hindsight must

be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.") ("The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done.); MPEP 706.02(j) ("After indicating that the rejection is under 35 U.S.C. 103, the examiner should set forth in the Office action ... (D) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification."); *Ex parte Clapp*, 227 USPQ 872, 973 (BPAI 1985) ("To support the conclusion ... the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references").

In the case at hand, the Examiner has not established a *prima facie* case of obviousness for at least the reason that he has not identified a rational basis why one of ordinary skill in the art would have electropolished or otherwise electrochemically modified the steel of Takehiro. The Examiner alleges that it would have been obvious to combine the references to achieve a mirror-like finish, but the Examiner does not give a rational basis for why this would have been obvious, as well as beneficial, as it relates to improved performance in SOFC's. This point is further discussed below.

Steels can be electrochemically modified to produce a shiny, mirror-like (specular) finish. In the medical and pharmaceutical arts, steel can also be electrochemically modified to provide a smooth surface that is free of voids in order to help keep the surface clean. The Examiner alleges that it would have been obvious to electrochemically modify the steel of Takehiro in order to remove scale and obtain a "bright mirror-like polished surface" as disclosed by Gamble. Neither of these known potential benefits of electrochemically modifying a steel surface, however, are the focus of the method of claim 11. Instead, the present inventor unexpectedly discovered that practicing the method of claim 11 significantly improves high temperature oxidation resistance of the modified surface. Electrochemical modification of the steel of claim 11 unexpectedly produces a surface that develops a beneficial metal oxide scale under high temperature oxidizing conditions, a scale that provides significantly improved high temperature corrosion resistance relative to untreated identical steels. The Examiner

has not identified why one of ordinary skill would have combined the cited art with the objective of obtaining the same result. Thus, the Examiner has not established a *prima facie* case that the rejected claims recite inventions that would have been obvious.

Assuming for the sake of argument only that the Examiner has in fact established a *prima facie* case of obviousness, such a case is clearly rebutted by secondary considerations inasmuch as the improvements obtained by the claimed method are wholly unexpected and significant. This is further discussed below and is supported by the attached Declaration of Dr. Michael P. Brady ("the Brady Declaration"), a senior researcher at Oak Ridge National Laboratory, Oak Ridge, Tennessee. As discussed in the Declaration, Dr. Brady has substantial experience in the area of oxidation of stainless steels and other alloys, has evaluated and developed ferritic stainless steels and related alloys for use in solid oxide fuel cells, and is experienced with electropolishing and other surface preparation techniques.

As stated in MPEP § 2141.01, "Objective evidence of secondary considerations such as unexpected results ... and skepticism of experts are relevant to the issue of obviousness and must be considered in every case on which they are present. When evidence of any of these secondary considerations is submitted, the examiner must evaluate the evidence." The MPEP also states that "A greater than expected result is an evidentiary factor pertinent to the legal conclusion of obviousness ... of the claims at issue." MPEP § 716.02(a).

In the case at hand, steel having the composition recited in claim 11 and treated by the method of claim 11 unexpectedly exhibits substantially improved high temperature corrosion resistance. In fact, as supported by the Brady Declaration, the method of claim 11 produces a significant improvement in corrosion resistance in a situation in which a diminished result would have been expected by those of ordinary skill. This fact is significantly pertinent to establishing nonobviousness. *See, e.g., In re Corkill*, 711 F.2d 1496 (Fed. Cir. 1985) ("[T]he claimed combination showed an additive result when a diminished result would have been expected. This result was persuasive of nonobviousness.") At the time the Subject Application was filed, as supported by the Brady Declaration, the conventional belief in the art was that an electropolished (*i.e.,*

smooth) steel surface would have a decreased level of high temperature corrosion resistance relative to the same steel surface processed to have a "rough" or mechanically deformed surface. In support of this fact, Applicant attaches the following two references, which are also referenced in the Brady Declaration:

- C. S. Giggins et al., "The Effect of Alloy Grain-Size and Surface Deformation on the Selective Oxidation of Chromium in Ni-Cr Alloys at Temperatures of 900° and 1000 °C", 245 Transactions of the Metallurgical Society of AIME at 2509-2514 (December 1969) (hereinafter "Giggins").

- J. M. Rakowski et al., "The Effect of Surface Preparation on the Oxidation Behavior of Gamma TiAl-Base Intermetallic Alloys", 35 Scripta Materialia at 1417-1422 (1996) (hereinafter "Rakowski").

Both Giggins and Rakowski teach the advantage of a mechanically deformed (*i.e.*, non-smooth) surface over an electropolished surface in regards to oxidation resistance. As described in Rakowski and as supported by the Brady Declaration, it was believed that mechanically deforming the surface of a stainless steel promotes selective oxidation of alloy elements, such as chromium, as a result of the numerous grain boundaries present on the deformed surface, which provide a "short circuit path" to the surface. Rakowski at 1421. In other words, because of the relatively numerous grain boundaries present near the deformed surface, chromium can readily diffuse to the steel surface. Thus, specimens having deformed (non-smooth) surfaces were found to form a corrosion-protective scale and their oxidation rate constants were about a factor of three smaller than those for electropolished (smooth) samples of the same steel. As noted in Giggins, "fine-grained or grit-blasted (mechanically deformed) specimens were always observed to oxidize slower than electropolished specimens." Giggins at 2514 (emphasis added).

Based on the above conventional belief in the art at the time the Subject Application was filed, and us set forth in the Brady Declaration, it was surprising and unexpected to discover that the electrochemically modified steel of claim 11, processed by the method of claim 11, actually exhibited substantially improved high temperature oxidation resistance compared with untreated, ground, polished, or otherwise

mechanically deformed samples of the same steel. These findings are clearly set forth in the specification of the Subject Application as filed and are contrary to the conventional belief, as shown by Giggins and Rakowski, and as confirmed by the attached Brady Declaration. Electrochemical modification according to claim 11 removes material from the treated alloy surface, providing a smoother surface with a reduced level of shape irregularities. Because the process recited in claim 11 proves a smoother surface, those having ordinary skill would have expected the method of claim 11 to result in a reduced level of high-temperature oxidation resistance relative to a mechanically deformed surface.

The present inventor amply demonstrated the surprising and unexpected results of the method of claim 11 in paragraphs 52-63 of the specification of the Subject Application. Specifically, the inventor tested steel samples having a chemistry within the ranges recited in claim 11 for high temperature oxidation resistance after the samples received several different surface treatments, including a standard "mill" surface, polishing with 120 grit SiC paper, and electropolishing. (Electropolishing is a process of electrochemically modifying a sample surface, and thus falls within the scope of claim 11.) As discussed in the Subject Application, the rate of oxidation of the electropolished surfaces was unexpectedly found to be several orders of magnitude lower than that of the mechanically finished mill surface and the polished surface.

In the Subject Application, the present inventor also treated a surface of a sample of the alloy recited in claim 11 using successively finer grinding papers and lapping compounds, ending with a step of polishing the sample surface with a 1 micron diamond paste. The final surface had the approximate physical smoothness and specular appearance of an electropolished surface. Unexpectedly, the electropolished surface still exhibited an order of magnitude reduction in oxidation weight change relative to the ground and polished sample. This surprising and significant result demonstrates that the substantially improved high temperature oxidation resistance provided by the method of claim 11 is not merely a function of surface smoothness (which, in any case, would be counter to the then-prevailing conventional wisdom) or the reflective appearance of the samples.

As further described in the Subject Application, the unexpected and surprising benefits of electrochemically modifying a surface of the steel as recited in claim 11 were demonstrated by first electropolishing and then lightly mechanically polishing with 1 micron diamond paste a steel having the composition recited in claim 11. Despite maintaining the specular finish of an electropolished sample, the improvement in oxidation resistance provided by electropolishing the sample was reversed after mechanically polishing the electropolished surface with the diamond paste. This result indicated that electropolishing the steel of claim 11 somehow advantageously modified the surface in a way other than merely by smoothing the surface. Again, this was an unexpected and nonobvious result.

The foregoing tests, which all are described in detail in the specification of the Subject Application, reinforce the fact that there are multiple methods to achieve a mirror-like, specular finish on ferritic stainless steels. However, mechanical polishing, such as with a diamond paste, despite producing a mirror-like finish visually indistinguishable from an electropolished surface, does not produce the improved oxidation resistance achieved by the method recited in claim 11. Although providing a mirror-like finish on an alloy surface is not the objective of the method of claim 11, it is, of course, a tertiary result. If achieving a shiny surface were truly the objective of the invention of claim 11, then it would not matter by what method it was achieved. Clearly, however, the invention of claim 11 produces the surprising, unexpected, and unobvious result of superior high temperature corrosion resistance through electrochemical modification only. This is fully supported by the attached Brady Declaration.

The invention of claim 11 has also achieved other unexpected results. Prior to the invention of claim 11, ferritic stainless steels had limited application in SOFC's (solid oxide fuel cells). This was for a least two reasons. First, in order to maximize the efficiency of SOFC's, the interconnects must have good electrical conductivity. However, even when provided with "deformed" surfaces, ferritic stainless steels form a surface oxide layer having low electrical conductivity at SOFC operating conditions. Second, the scale that forms on ferritic stainless steels typically grows thicker with time, further decreasing the efficiency of the SOFC. Before the present inventor discovered

the advantages of the composition and method of claim 11, it was known to make an alloy that formed a highly electrically conductive scale or an alloy in which the scale thickened at an extremely slow rate. However, due to the underlying mechanism controlling these properties, providing a steel with a surface that develops both an electrically conductive scale and a slow-growing scale could not be achieved. The present method of claim 11, however, produces a surface that develops a scale that is both electrically conductive and slow-growing when subjected to high temperature oxidizing conditions. The aluminum-rich oxide scale that forms on the steel of claim 11 under SOFC operating conditions is electrically conductive. The scale differs in its a_o and c_o lattice parameters from certain other alloys producing alpha Cr_2O_3, Fe_2O_3, and alpha Al_2O_3 scales.

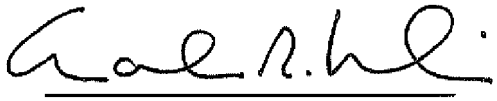
The Examiner alleges that removal of scale is one reason for practicing the method recited in claim 11. That is incorrect. A purpose for electromechanically modifying a steel according to claim 11 is to produce a surface that develops a beneficial, slow-growing, electrically conductive scale under SOFC operating conditions. Producing a ferritic stainless steel that is both oxidation resistant and forms a slow-growing and electrically conductive scale when subjected to SOFC operating conditions is a surprising, unexpected, significant, and nonobvious result of practicing the method recited in claim 11.

For the reason set forth above, Applicant respectfully requests withdrawal of the rejection of claims 11-12, 14 and 16-22 under § 103 over Takehiro in view of Gamble.

CONCLUSION

Applicant asserts that the claims of the Subject Application, as amended herein, are directed to subject matter that is patentable over the cited references. As such, Applicant respectfully requests that the Examiner enter the amendments submitted herein and issue a Notice of Allowance at an early date. If, however, the Examiner is of the opinion that the Subject Application is in condition for disposition other than allowance, Applicant respectfully requests that the Examiner contact Applicant's attorney at the telephone number listed below so that those concerns may be addressed.

Respectfully submitted,



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MEMORANDUM

DATE: **May 3, 2007**

TO: **Technology Center Directors**

FROM: **Margaret A. Focarino**
Deputy Commissioner
for Patent Operations

SUBJECT: **Supreme Court decision on *KSR Int'l. Co., v. Teleflex, Inc.***

The Supreme Court has issued its opinion in *KSR*, regarding the issue of obviousness under 35 U.S.C. § 103(a) when the claim recites a combination of elements of the prior art. *KSR Int'l Co. v. Teleflex, Inc.*, No 04-1350 (U.S. Apr. 30, 2007). A copy of the decision is available at http://www.supremecourtus.gov/opinions/06pdf/04-1350.pdf. The Office is studying the opinion and will issue guidance to the patent examining corps in view of the *KSR* decision in the near future. Until the guidance is issued, the following points should be noted:

(1) The Court reaffirmed the *Graham* factors in the determination of obviousness under 35 U.S.C. § 103(a). The four factual inquiries under *Graham* are:

(a) determining the scope and contents of the prior art;
(b) ascertaining the differences between the prior art and the claims in issue;
(c) resolving the level of ordinary skill in the pertinent art; and
(d) evaluating evidence of secondary consideration.

Graham v. John Deere, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966).

(2) The Court did not totally reject the use of "teaching, suggestion, or motivation" as a factor in the obviousness analysis. Rather, the Court recognized that a showing of "teaching, suggestion, or motivation" to combine the prior art to meet the claimed subject matter could provide a helpful insight in determining whether the claimed subject matter is obvious under 35 U.S.C. § 103(a).

(3) The Court rejected a rigid application of the "teaching, suggestion, or motivation" (TSM) test, which required a showing of some teaching, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the prior art elements in the manner claimed in the application or patent before holding the claimed subject matter to be obvious.

(4) The Court noted that the analysis supporting a rejection under 35 U.S.C. § 103(a) should be made explicit, and that it was "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements" in the manner claimed. The Court specifically stated:

> Often, it will be necessary . . . to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an **apparent reason** to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis **should be made explicit.**

KSR, slip op. at 14 (emphasis added).

Therefore, in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.